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THE
BOTANICAL GAZETTE

AUGUST 1920

STUDIES IN THE GENUS *BIDENS*. V

CONTRIBUTIONS FROM THE HULL BOTANICAL LABORATORY 269

EARL E. SHERFF

(WITH PLATES XI-XIV)

Bidens exigua, sp. nov. (pl. XI).—Herba annua, 1.5–3 dm. alta; caule tenuissimo, subrecto, striato, subsimplici. Folia opposita (summa alternata), membranacea, petiolata, petiolo adjecto 3–5 cm. longa, bipinnata, glabra; foliolis (3 aut 5) maximam partem 3–5-partitis; lobis integris, subobtusis, infirme apiculatis. Petioli 0.5–2 cm. longi, basi connati. Capitula pauca aut solitaria, discoidea, tenuiter pedunculata pedunculis 2–5 cm. longis, ad anthesin 5–6 mm. longa et 1.5–2 mm. lata infra, 2–3 mm. lata supra; in fructu, circ. 9 mm. longa et 2–5 mm. lata. Involucrum basi sparsim hispidum aut glabratum; bracteis duplici serie dispositis; exterioribus (4–7) linearibus, 2–3 mm. longis, ciliatis, ad faciem glabris aut pubescentibus, ad apicem induratis; interioribus dimidio longioribus, glabratiss, lanceolatis, striatis, margine diaphanis. Achaenia (submatura) linearia, glabra aut supra ad margines remote hispida, bi- aut triaristata aristis retrorsum hamosis hamis tenuibus, 4–8 mm. longa.

SPECIMENS EXAMINED.—C. H. T. Townsend 1513, alt. 1607 m., Chosica Canyon, Peru, April 20, 1913 (Herb. U.S. Nat. Mus., no. 602943, type).

The plants of the type sheet would seem at first to be merely depauperate or impoverished forms of some species normally larger and perhaps already described. The technical characters, however, do not match those of any other species known to me. There are several species very close to *B. exigua* all of

which might once easily have passed for *B. bipinnata* L., yet which, with subsequent advances in our knowledge, have been proved indisputably to be distinct and severally valid. Among these are *B. heterosperma* Gray and *B. Lemmoni* Gray of the southwestern United States and Mexico, and *B. parviflora* Willd. of Asia. *B. exigua* is nearest to *B. Lemmoni* and *B. parviflora*; like these, it may well be expected to prove constant and worthy of specific rank.

Bidens duranginensis, sp. nov. (pl. XI).—Herba annua, glabrata, demum circa 6–9 dm. alta; caule subtetragono, ramis acute tetragonis, ramis acute tetragonis, longis et tenuibus, striatis, infra minute pubescentibus. Folia opposita, petiolata, petiolo adjecto 10–12 cm. longa (eis ramorum 1–3 cm. longis), pinnata, serrata aut dentata (aut etiam inciso-dentata), ciliata, foliolis ovatis aut ovato-lanceolatis, saepe duobus aut quatuor imis cuiusque folii tripartitis. Petioli (foliorum caulis) 2.5–4 cm. longi, ad basim ciliati et connati. Capitula multa, subligulata, tenuiter pedunculata, pedunculis 3–8 cm. longis, ad anthesin 4–7 mm. alta et (ligulis adjectis) 0.8–1.3 cm. lata, in fructu 1.2–1.4 cm. alta et 6–8 mm. lata. Involucrum basi hispidum, bracteis duplici serie dispositis; exterioribus (circ. 8) linearibus, fere glabris, apice induratis, 2–3 mm. longis; interioribus dimidio longioribus, anguste lanceolatis; membranaceis, margine diaphanis. Ligulae (3–6) subalbidae, anguste ovatae, 4–7-striatae, 4–6 mm. longae. Achaenia linearia, nigra, glabra aut supra sparsim hispida, 2–4-aristata aristis flavis et retrorsum hamosis, corpore 6–12 mm longa.

SPECIMENS EXAMINED.—*Dr. Edward Palmer* 756, west side of Iron Mountain, vicinity of city of Durango, Durango, Mexico, October 1896 (Herb. Gray, type; Herb. Field Mus., no. 51825; Herb. U.S. Nat. Mus.); *idem* 612, vicinity of city of Durango, Durango, Mexico, April to November 1896 (Herb. Field Mus., nos. 51704 and 51705; Herb. Gray, differing from type material, apparently, merely in being somewhat younger).

This species, if we attempt to delimit it in a taxonomic way, is confessedly of unsatisfactory status. The type collection had been determined as *Bidens anthriscoides* DC., but the plants are very different from the type material of that species (*Berlandier* 1010, Herb. Brit. Mus.; Herb. Drake, Paris). It is manifestly an ally of *B. pilosa* L., from which it differs in its whitish rays and in its foliage, the lower leaflets of the stem leaves tending to be distinctly tripartite. This last character distinguishes it likewise from *B. leucantha* (L.) Willd. In foliage characters it slightly simulates *B. chinensis* (L.) Willd. of

the Orient and *B. subalternans* DC. of South America. I have seen two specimens by E. O. WOOTON from New Mexico (Mesilla Valley, Dona Ana County, October 1895, U.S. Nat. Herb., nos. 561445 and 663170; referred to *B. anthriscoides* DC. by WOOTON and STANDLEY, Contrib. U.S. Nat. Herb. 19:704. 1915) that are evidently true *B. bipinnata* L., yet which approach *B. subalternans* DC. A third plant, also by WOOTON (Las Cruces, New Mexico, October 1895, Herb. N.Y. Bot. Gard.), approaches *B. subalternans* DC. in foliage still more, but is nevertheless clearly a form of *B. bipinnata* L. All three of these plants are suggested by the type of *B. duranginensis*. They appear, however, to be entirely distinct in a specific way. Future field studies, to determine the range of variation and the limits of demarcation for the Durango plants, are highly desirable.

No other group in the genus *Bidens* has been so badly neglected heretofore, considering the number of species involved, as has that group native to the Hawaiian Islands and other islands of the Pacific, and, by some authors, segregated as a separate genus, *Campylotheca*. Nearly a century ago GAUDICHAUD (Voy. Freycinet Bot. 464. pl. 85. 1826-1829), describing a species collected in the Hawaiian Islands during FREYCINET's voyage, named the plant *Bidens micrantha*. Shortly afterward CASSINI (Dict. Sci. Nat. 51:475. 1827) called attention to the curved achenes of GAUDICHAUD's species. He made this achenial character the basis for proposing his new genus *Campylotheca*. Later LESSING (Linnaea 6:508. 1831) accepted CASSINI's genus for species like *Bidens micrantha* Gaud., but he erected a new genus, *Adenolepis*, to include a somewhat different form. I propose to discuss *Adenolepis* in a future article. Concerning *Campylotheca*, however, we may proceed to note that the name was retained by DE CANDOLLE in his *Prodromus* (5:593. 1836), although elsewhere it was accorded only slight attention. In fact, the collections in those days embraced so few specimens from the Pacific Islands that little study was made of the Pacific flora by taxonomists. NUTTALL, in 1841 (Trans. Amer. Phil. Soc. N.S. 7:368), reduced *Campylotheca* to the rank of a section under *Bidens*, but did not give extended reasons for so doing. His attention had been directed to the subject by his having traveled among the Hawaiian Islands and discovered there at least one new species of *Bidens* (*B. gracilis*). NUTTALL, however, did evince a rejection of CASSINI's main character for *Campylotheca*,

namely, the curved or twisted achenes. He worded his description to read "sometimes curved or contorted," and for one species (*B. mutica*) he definitely described the achenes as "straight." Since NUTTALL'S time, we may add, many other closely affiliated species have been discovered, including forms of *Bidens micrantha* itself, which have straight achenes, thus bringing the curved-achene character into discredit. In 1856 SCHULTZ BIPONTINUS undertook the determination of various specimens collected on Nukahiva by EDWARD JARDIN. Finding four new species native to this single small island, SCHULTZ BIPONTINUS appears to have entered upon a very careful and painstaking research into the subject of their generic affinities, finally publishing his results¹ (Flora 39:357. 1856). As regards the maintenance of a genus *Campylotheca* apart from *Bidens*, he was unreservedly against such a course. His four new species from Nukahiva and all of the Hawaiian species he referred to *Bidens*.

In my own attempts accurately to evaluate SCHULTZ BIPONTINUS' opinion, I sought four years ago to repeat his studies upon the Nukahiva species. Through the generous assistance of M. ST. AHNNE, President of the Chamber of Agriculture of Tahiti, and the careful, persistent search by his friend, M. HENRY, President of the French Alliance of Nukahiva,² I have been able to secure many mature achenes and herbarium specimens from the same island where JARDIN originally collected. Achenes of each kind were planted, and thus, during a period of three years, several hundred live plants have been obtained for observation. Having supplemented in this way my examination of the few herbarium specimens available, I have been able to match all of SCHULTZ BIPONTINUS' four descriptions very well. The four species (*Bidens cordifolia*, *B. polycephala*, *B. serrulata*, *B. Jardinii*) are clearly distinct in leaf characters of the older plants and in fruit characters. More-

¹ For a personal estimate, apparently unbiased and accurate, of the taxonomic ability and sagacity that SCHULTZ BIPONTINUS displayed at times, see BENTHAM, Jour. Linn. Soc. 13:340. 1873.

² I cannot too gratefully thank M. ST. AHNNE and M. HENRY for their great kindness shown to me during the progress of my work. Repeatedly they have assisted in procuring for me the very materials that were essential for a correct understanding of the far away Pacific Island flora.

over, none of the four is found to differ generically from the various Hawaiian species, both groups even emitting the same peculiar carrot-like odor when the leaves are bruised. There can remain no doubt, therefore, regarding the exact basis of SCHULTZ BIPONTINUS' study. Furthermore, the scholarly and critical way in which he attacked the entire subject must needs inspire a strong sense of confidence in his judgment and in the course pursued by him in equating *Campylotheca* with *Bidens*.

In 1861 ASA GRAY (Proc. Amer. Acad. 5:125-128) made the next important contribution to a knowledge of the group. GRAY had received from the Museum of Natural History in Paris several specimens collected by M. J. REMY in the Hawaiian Islands, also a number from the United States Exploring Expedition under Captain WILKES, collected in the Hawaiian Islands, Tahiti, Eimeo, and elsewhere in the Pacific. Most of these were new species. GRAY's publication indicates that he was probably unaware of SCHULTZ BIPONTINUS' paper. Thus, for example, he inadvertently created the name *Coreopsis Macraei* for a plant already named by the latter *Bidens Campylotheca*. As, therefore, he does not seem to have read SCHULTZ BIPONTINUS' paper, it is all the more interesting and valuable to find that GRAY, too, was compelled to abandon the name *Campylotheca*. Species having the achenes wingless and the awns retrorsely barbed he described under *Bidens*. But several other species, different in having either exaristate achenes or even winged achenes, he described under *Coreopsis*. Thus he described *Bidens hawaiiensis*, *B. lantanoides*, *Coreopsis mauiensis*, *C. macrocarpa*, *C. Macraei*, *C. cosmoides*, and *C. Menziesii*. GRAY's own words at the time of describing some of these species are worthy of note. Speaking of the futility of maintaining *Campylotheca* as a separate genus, apart from *Bidens* and *Coreopsis*, he said: "Its adoption merely gives us three limitless genera unmarked by any peculiarity in habit, in the place of two artificially separated ones. . . . Vain is the attempt to draw absolute limits where Nature luxuriates in gradations" (Proc. Amer. Acad. 5:126. 1862).

In 1888 there appeared the posthumous *Flora of the Hawaiian Islands* by WILLIAM HILLEBRAND. HILLEBRAND, from his twenty years of resident study in the Hawaiian Islands and his careful

investigations subsequently, was eminently well versed in their species. His treatment assumes almost the aspect of a monographic revision, and it is evident that he possessed much more than an ordinary knowledge of *Bidens* and related groups. His brilliancy, however, appears to have been manifested, as is so apt to occur with a local botanist, less in the excellence of his genus concept than in that of his species concept. And, even in the latter respect, his generalizations are often necessarily faulty because of the inadequacy of his material. HILLEBRAND, like GRAY, appears never to have seen SCHULTZ BIPONTINUS' paper. He discarded GRAY's treatment, however, and adopted once again CASSINI's name *Campylotheca*. Speaking of *Campylotheca* he says (p. 211): "The genus, as it presents itself now, stands evidently nearer to *Bidens* than to *Coreopsis*, and might be merged in the former if it were not for the winged achenes of so many species,³ which, if admitted in the character of *Bidens*, would efface the limits between that genus and *Coreopsis*." GRAY's Hawaiian *Bidens* is transferred by HILLEBRAND to *Campylotheca*.

This effort to break down the genus *Bidens* into smaller units is not the first of its kind. As early as 1790,⁴ NECKER (Elem. Bot. 1:86-87) subdivided the genus into two new genera. For these he proposed the names *Pluridens* and *Edwardsia*; the first group to include those species with simple foliage (for example, *Bidens cernua* L.), the second to include those species with foliage dissected (for example, *B. pilosa* L. and *B. pinnata* L.). In 1794, MOENCH (Meth. 569 and 595) followed NECKER's treatment essentially, but substituted the names *Bidens* and *Kerneria* for NECKER's two names. Neither NECKER's treatment nor that of MOENCH is today accepted by botanists. In 1836, DE CANDOLLE (Prodr. 5:633) described a new plant that resembled *Bidens*, but which appeared remarkable in having the ligules pistillate and fertile. DE CANDOLLE created the genus *Delucia* therefor, and his new plant he named *Delucia ostruthioides*. Later SCHULTZ BIPONTINUS (Seem. Bot. Voy. Herald 308. 1852-1857) renamed the species *Bidens ostruthioides*, and this latter name has been widely accepted

³ Regarding the inaccuracy of this statement, cf. footnote 8.

⁴ Cf. E. L. GREENE, *Pittonia* 4:245. 1901.

ever since.⁵ In 1901, GREENE (*Pittonia* 4:242-270) presented the results of a study of *Bidens*. He commented upon the dissimilarity between such species as *B. cernua* L. and *B. tripartita* L. Even so radical a botanist as he, however, refrained from proposing a generic segregation of the *B. cernua* forms. Nevertheless, GREENE did segregate the aquatic *Bidens Beckii* as the type of a new genus, *Megalodonta*; and, when the peculiar achenes of this species are considered, it seems wise to accept GREENE's new genus as valid.

Strangely enough, no one appears to have tried to segregate generically the pronounced and well defined group of *Bidens* species typified by the species *Bidens reptans* (L.) G. Don.⁶ These species differ from the more typical species in being climbers, and in having long flat achenes that are hispid along the two edges in such a way at times as to suggest a centipede. Again, my own *Bidens mirabilis* (BOT. GAZ. 61:496. pl. 31. 1916), with achenes flat, strongly constricted above into a thick neck and crowned with even 8-10 aristae, might be segregated as the type of a new genus. Similarly, the anomalous *Bidens clarendonensis* Britton, with trailing, somewhat woody stem, and thick, rhombic-ovate leaves, would be interpreted by some as representing a new genus.

Thus it is seen that, if we accept the narrow concept of *Bidens* held by CASSINI, LESSING, and HILLEBRAND, and seek to segregate the native Pacific species under the name *Campylotheca*, to be consistent we shall have to subject the entire genus *Bidens* to a process of subdivision and segregation, resulting in some six or eight genera. There are at least two good reasons for not adopting such a course. In the first place, the accuracy of such a series of interpretations is not so well established as to justify overturning almost the entire nomenclature of the genus. In the second place, the lines of demarcation among the various subordinate groups are

⁵ In the herbaria *Bidens ostruthioides* is the universally used name. It is interesting to note that a closely similar form was described by KLATTE as *Bidens guatemalensis* (Bot. Jahrb. 8:44. 1887). Another related form, apparently more clearly distinct, however, was placed by BENTHAM in *Bidens* and described as *B. costaricensis* (Benth. ex Oerst., Kjoeb. Vidensk. Meddel. 94. 1852).

⁶ DE CANDOLLE (Prodr. 5:599. 1836), however, did create the name *Bidens Coreopsidis* for one of these species. And, even earlier, the names *Coreopsis reptans* L., *Coreopsis incisa* Ker., etc., had been given to certain of these species, but without very serious consideration being given to their generic affiliations.

so fluctuating and inconstant that efforts to apply a binomial system of nomenclature to the many species would be rendered even much more difficult than before. I am constrained to reject, therefore, any idea of seriously interfering with the general status of *Bidens*. CASSINI's name *Campylotheca* I am compelled to discard.⁷

Having laid aside the name *Campylotheca*, there remains one further matter with which to deal. As stated previously (BOT. GAZ. 59:308. 1915), we find among the numerous species of *Bidens* and the allied genus *Coreopsis* "no absolute uniformity in even one distinctive character. However, one such character does persist to a surprising extent. It is the presence (in *Coreopsis*) or absence (in *Bidens*) of two lateral wings upon the mature achene. Among so many species from widely remote regions does this character separate two genera with different aspects that, *in cases where other criteria are absent*, it appears to offer the only logical basis of distinction." This presence or absence of achene wings was given great weight by GRAY, but in the Pacific flora the wing character is unreliable, and will lead, if absence of wings be demanded from all species of *Bidens*, to an arbitrary and unnatural arrangement. Some three or four Hawaiian forms commonly have accessory awns or barbs below the achene's apex, and either these or the principal awns frequently are decurrent along the achenial edges as a more or less thickened margin or even as a wing; or at times the awns seem unrelated to the wings. In "*Coreopsis mauiensis*" Gray, these wings are very conspicuous. The number of Hawaiian

⁷ In taking this step it is reassuring to read the words of so eminent a student of the Compositae as BENTHAM. Speaking of CASSINI and his work, he stated (Jour. Linn. Soc. 13:338. 1873): "Unfortunately, however, in working out the details of the genera in the 'Dictionnaire,' he indulged in an enormous and useless multiplication of generic names, which only tended to throw the nomenclature into confusion, and cast a slur upon all his labors. Wherever he observed a slight difference in the involucre, pappus, or general aspect, or could not readily identify an imperfect specimen, an engraved figure, or a description often incorrect, he at once set it down as a new genus, and has thus, more than any other botanist of equal ability, overloaded the science with useless synonyms. So recklessly, indeed, did he give way to this mania of coining new names, that he on many occasions proposed two, or even three, for the same genus, leaving future botanists to take their choice." CASSINI did not neglect *Campylotheca* in this respect. At the very outset he proposed *Dolicotheca* as an alternative name. This latter name, however, was never adopted by LESSING, DE CANDOLLE, or others.

species that exhibit this character, however, is very small compared with the remaining Pacific species that lack it.⁸ Moreover, a study of their other characters, such as odor of bruised foliage (when fresh) and shape of ligules, as well as range of distribution, shows them to be much closer to the wingless-achened *Bidens* species of the Pacific than to the wing-achened American species, *Coreopsis lanceolata* L., that must be taken as the type of the genus *Coreopsis*. It seems wise, therefore, to transfer such species directly to *Bidens* rather than leave them with *Coreopsis*, where originally placed by GRAY. We shall have even then no greater incongruity in *Bidens* than must perforce be tolerated in *Coreopsis*. Thus, for example, all authors who have dealt with the subject have retained the North American wingless-achened *Coreopsis rosea* Nutt. and *C. tinctoria* Nutt. in *Coreopsis* despite their anomalous achenes, because their other characters clearly indicated a closer affinity with *Coreopsis*. Manifestly this was the only correct course to pursue, and my own procedure is precisely comparable.

In the following list, therefore, such transfers are made. In addition, there are transferred certain other species that were described by GRAY under *Coreopsis* (where he placed them because they lacked retrorsely barbed awns; cf. BOT. GAZ. 59:305-308. 1915), or by HILLEBRAND under *Campylothea*. The new names are:

Bidens molokaiensis (Hillebr.), comb. nov.—*Campylothea molokaiensis* Hillebr., Fl. Hawaiian Isls. 212. 1888.

Bidens macrocarpa (Gray), comb. nov.—*Coreopsis* (*Campylothea*) *macrocarpa* Gray, Proc. Amer. Acad. 5:126. 1862.

Bidens Remyi (Hillebr.), comb. nov.⁹—*Campylothea Remyi* Hillebr., loc. cit., 212; *Coreopsis Hillebrandiana* Drake del Cast., Illustr. Fl. Ins. Mar. Pacif. 209. 1890.

⁸ Cf. HILLEBRAND'S misleading words, "the winged achenes of so many species." Doubtless HILLEBRAND was recalling many specimens of a few species, and unguardedly referring to them as "so many species." Reference to his individual descriptions shows few of the species to be described as wing-achened.

⁹ This species was based by HILLEBRAND upon *M. J. Remy* 287, a single specimen in Gray Herbarium. I have seen not only the type but an excellent duplicate in Paris (Herb. Mus. Hist. Nat.), also fine specimens collected by *Faurie* (Herb. Brit. Mus.), *Forbes* (Herb. Bernice Pauahi Bishop Mus.), etc. The species should not be confused with *Bidens Remyi* Drake del Cast. (Illustr. Fl. Ins. Mar. Pacif. pl. 39. 1888; *Coreopsis Remyi* Drake del Cast., loc. cit., 210), a species founded upon *M. J. Remy* 281,

Bidens dichotoma (Hillebr.), comb. nov.—*Compylotheca dichotoma* Hillebr., *loc. cit.*, 212.

Bidens mauiensis (Gray), comb. nov.—*Coreopsis mauiensis* Gray, Proc. Amer. Acad. **5**:125. 1862; *Compylotheca mauiensis* Hillebr., *loc. cit.*, 213.

Bidens cosmoides (Gray), comb. nov.—*Coreopsis* (*Compylotheca*) *cosmoides* Gray, *loc. cit.*, 126.

Bidens Menziesii (Gray), comb. nov.—*Coreopsis* (*Compylotheca*) *Menziesii* Gray, *loc. cit.*, 127.

A most remarkable feature of the flora of the Hawaiian Islands is the large number of endemic species. For a number of years botanists have been cognizant of this pronounced degree of endemism (cf. HILLEBRAND, Fl. Hawaiian Isls. pp. xv and xxv. 1888; MACCAUGHEY, Amer. Botanist **22**:45–52. 1916; BOT. GAZ. **64**:89–114. 1917; *loc. cit.*, **66**:273–275. 1918). Furthermore, the scanty supply of Hawaiian specimens available in most herbaria often makes a proper interpretation of the various endemic forms practically impossible at the present day.

In 1917, almost in despair of being able to arrive at satisfactory opinions respecting several Hawaiian species of *Bidens*, I appealed to certain botanists resident there for aid. One of these, Professor CHARLES N. FORBES, Curator of Botany at the Bernice Pauahi Bishop Museum in Honolulu, proved able to render me assistance of the utmost value. In 1919 he placed at my complete disposal the entire *Bidens* collection of the Bishop Herbarium, also a set of duplicates (later deposited in Field Museum, Chicago). Among these were specimens not only by HILLEBRAND, MANN and BRIGHAM, and other older collectors, but also by FORBES, BRYAN, STOKES, and others of the present century. A considerable portion had

but which clearly is a mere form of *Bidens micrantha* Gaud. A specimen of *Remy* 281 in Gray Herbarium had been erroneously determined by ASA GRAY as being *Bidens sandvicensis* Less. var. *heterophylla* Gray. Later, HILLEBRAND (*loc. cit.*, 216), having seen this sheet at Gray Herbarium and assuming GRAY's determination to be correct, naturally equated GRAY's *B. sandvicensis* var. *heterophylla* with *B. micrantha* Gaud. But the true *B. sandvicensis* Less. var. *heterophylla* Gray was based upon a plant in Kew Herbarium collected by BEECHEY on the Island of Oahu, and treated by HOOKER and ARNOTT as *Bidens luxurians*. This plant of BEECHEY's is wholly distinct from *B. micrantha* Gaud. and from our *B. Remyi*.

been collected in localities never before visited by botanists. Many of the plants collected even from the better known localities were much superior in point of maturity and state of preservation to those previously collected by other botanists. No less than eleven species were found to be new. Still other species, while not new to science, were represented in such excellent or numerous forms that more elaborate descriptions and more accurate concepts were possible than when the species were first described. The descriptions, with lists of specimens examined, are presented herewith.

Bidens cervicata, sp. nov.—Glabra, supra herbacea, infra forsan suffruticosa, caule acute tetragono, ramoso, ≈ 8 dm. alto. Folia membranacea, pinnata aut summis tripartita, petiolis adjectis 7–15 cm. longis, foliolis lanceolatis, acuminatis, serratis dentibus acribus et tenuiter mucronatis, sparsim ciliatis, 2.5–9 cm. longis et 0.8–2.8 cm. latis, petiolis tenuibus 1.5–4 cm. longis. Capitula multa, subcorymbosa, ligulata, ad anthesin 5–7 mm. alta et 1.5–1.8 cm. lata. Involucri bractee exteriores plerumque 5, lineares, glabratae, patentes aut reflexae, 1.5–2.5 mm. longae, interioribus multo breviores. Ligulae circ. 5, flavae, ovato-lanceolatae vel elliptico-oblongae, apice saepe profunde et acriter dentatae, 7–9 mm. longae. Achaenia tenuiter linearia, nigra, exalata, exaristata, glabra aut 1-paucis setis munita, torta, infra angustata, supra cervici-elongata, 1–1.3 cm. longa.

SPECIMENS EXAMINED.—*C. N. Forbes* 1085 K, Waimea Drainage Basin, west side, Kauai, July 3 to August 18, 1917 (Herb. Bishop Mus., type; Herb. Field Mus., no 485172).

Bidens amplexens, sp. nov.—Herbacea supra, infra verisimiliter suffruticosa, ramosa, caule ramisque tetragonis, glabra, probabiliter 5–8 dm. alta. Folia plerumque pinnata, membranacea, petiolis adjectis 4–12.5 cm. longis et 3–7.5 cm. latis; foliolis 3–5, ovato-lanceolatis, serratis dentibus orbiculatis, ad apicem acuminatis, terminali saepe maiore, petiolis tenuibus 2–4 cm. longis. Capitula non multa, sub-solitaria in pedunculis, laxissime corymbosa, adolescentia iis *Cosmi* specierum non dissimilia, florescentia 6–8 mm. alta et 3–3.5 cm. lata. Involucri bractee exteriores 5–6, valde reflexae, crassiusculae, lineari-oblongatae, ad apicem

subacutae et glanduloso-apiculatae, 3-6 mm. longae, quam interiores paulo breviores. Ligulae 7-8, anguste obovatae, apice obscure dentulatae, 1.5-1.8 cm. longae. Achaenia submatura nigra, plana, exalata, marginibus apiceque setulosa, exaristata aut obscurissime biaristata, circ. 8 mm. longa.

A plant of peculiar aspect, embracing habitual characters of *Cosmos* and *Coreopsis* as well as of *Bidens*, hence the name *amplectens*.

SPECIMENS EXAMINED.—*C. N. Forbes* 1839 O, Kawaihapai, Waianae Range, Oahu, Hawaiian Islands, *sine tempore legendi* (Herb. Bishop Mus., type; Herb. Field Mus., no. 485361).

***Bidens micranthoides*, sp. nov.**—Herba glabrata, infra suffruticosa, supra ramosa, ramis gracilibus, 3-5 dm. alta. Folia pinnata aut rarius ternata, petiolis adjectis 3-7 (-12.5) cm. longis et 2-5 (-8) cm. lata, foliolis ovato-lanceolatis aut raro ovatis, serratis, ad apicem plerumque acutis aut etiam longissime acuminatis, nunc membranaceis, nunc subrugoso-crassiusculis, foliolis imis raro tripartitis, petiolis tenuibus 1-5 cm. longis. Capitula supra folia exserta, laxe corymbosa, ad anthesin 5-7 mm. alta et 1.5-2.5 cm. lata. Involucri bracteae exteriores 5-7, lineares, ad apicem subobtusae, glabratae aut glanduloso-pulverulentae, 1-2.5 mm. longae interioribus multo longioribus. Ligulae 4-6, flavae, ovato-oblancheolatae, ad apicem 2-4-dentulatae, circa 1 cm. longae. Achaenia linearia, exalata, supra et ad margines sparsim setosa, apice setoso-coronulata et biaristata aristis retrorsum hamosis aut saepe plus minusve exaristata, 7-9 mm. longa.

SPECIMENS EXAMINED.—*Captain Beechey*, Oahu (May 19-30, 1826, *fide* Hook. and Arn., Bot. Beech. Voy. p. i. 1841) (Herb. Hookeri in Herb. Kew); *C. N. Forbes* 494 K, Wailua Falls, Kauai, October 5, 1916 (Herb. Bishop Mus.; Herb. Field Mus., no. 485156); *idem* 592 K, Nonou Mountains, Kauai, October 16-17, 1916 (Herb. Bishop Mus.; Herb. Field Mus., no. 485160); *idem* 704 K, Haupu Range, above Nawiliwili Bay, Kauai, October 31, 1916 (Herb. Bishop Mus., type); *idem* 1405 O, Manoa Valley, Oahu, November 23, 1909 (Herb. Bishop Mus.; Herb. Field Mus., no. 485254); *idem* 1849 O, Waiolani Ridge, Oahu, October 27, 1913 (Herb. Bishop Mus.); *idem* 2014 O, ridge east of Kuliououiki, Oahu, November 17, 1914 (Herb. Bishop Mus.).

As the name suggests, this species resembles more or less *B. micrantha* Gaud. In some cases the resemblance in foliage is very deceiving. The preceding specimen by *Beechey* had been determined as *B. micrantha* by HOOKER and

ARNOTT (cf. Hook. and Arn., Bot. Beech. Voy. 86. 1841), although in this case the foliage was very distinct from that of GAUDICHAUD's plate for *B. micrantha*. ASA GRAY, who later studied the *Beechey* plant, referred it incorrectly to *B. sandvicensis* Less. (cf. Gray, Proc. Amer. Acad. 5:128. 1862). From both *B. micrantha* and *B. sandvicensis* my species differs most noticeably in habit, being lower in stature, apparently more open in its branching, and certainly with the inflorescence much more open, the heads being variously scattered and at different levels, not so corymbose.

Bidens Stokesii, sp. nov. (pl. XII).—Supra herbacea, infra verisimiliter fruticosa, glabra, caule subtetragono, ramoso, ≈ 6 dm. alto. Folia ternata aut 5 foliolis pinnata, membranacea, non ciliata, petiolis adjectis 4–9 cm. longa et 2.5–6 cm. lata, foliolis rhomboideo-ovatis aut lanceolatis, terminali interdum breviter acuminato, orbiculato-serratis, raro inciso-lobulatis, petiolis tenuibus 1.5–4 cm. longis. Capitula pauca, paniculato-corymbosa, tenuiter pedunculata (ad fines ramorum 10–14 cm. nudorum) pedunculis 1–5.5 cm. longis, ligulata, ad anthesin circ. 7 mm. alta et 2–2.5 cm. lata. Involucri bractee exteriores circ. 8, lineares, glabratae aut sparsissime hispidae, apice indurato, 3–4 mm. longae, erectae aut recurvatae. interioribus longiores. Ligulae 6–7. flavidae, oblongae, apice obscure dentulatae, 7–10 mm. longae. Achaenia linearia, nigra, glabra, interdum plano-marginata sed non vere alata, saepe biaristata aristis tenuibus et obscure retrorsohamosis, ≈ 7 mm. longa.

SPECIMENS EXAMINED.—*John F. G. Stokes, sine numero*, foot of plateau, southeast, Niihau, January 1912 (Herb. Bishop Mus., type).

Bidens asplenioides, sp. nov. (pl. XII).—Supra herbacea, infra verisimiliter suffruticosa, glabra, ramosa, caule subtetragono, ≈ 4 dm. alto. Folia submembranacea, pinnata aut ternata, crenata, petiolis adjectis 6–16 cm. longa; foliolis lanceolatis aut anguste ovato-lanceolatis, non ciliatis, terminali ad apicem longe acuminato, 6–8 cm. longo, lateralibus ad apicem acutis vel subobtusis et dimidio brevioribus; petiolis tenuibus 3–7 cm. longis. Capitula multa, ligulata, ad anthesin circ. 1.5–2 cm. lata et 6–8 mm. alta, pedunculis tenuibus 1–6 cm. longis. Involucri bractee exteriores circ. 5, lineari-spathulatae, demum reflexae, glabratae, circ. 2 mm. longae; interioribus lanceolatae, dimidio longioribus. Ligulae (mancas tantum vidi) flavae, circ. 8–10 mm. longae.

Achaenia (manca vidi) linearia, exalata, supra glabrata aut sparsim setosa, apice nuda aut biaristata, verisimiliter 5-7 mm. longa.

SPECIMENS EXAMINED.—*J. F. G. Stokes*, Kaali, Niihau, January 1912 (Herb. Bishop Mus., type).

The elongate crenate terminal leaflets offer a curious superficial resemblance in outline to the leaves or leaflets of some species of *Asplenium* (*A. pinna-tifidum* Nutt. etc.). In shape of leaves, length of petioles, habit of inflorescence, number of capitula, proportionate length of exterior involucre bracts, and various other respects, this species is sharply separate from *B. Stokesii*.

Bidens valida, sp. nov.—Supra herbacea, infra verisimiliter fruticosa, glabra, caule tetragono, valido, ≈ 7 dm. alto. Folia (exsiccata) atra supra, acriter serrata, non ciliata, petiolis adjectis 4-15 cm. longa; superiora indivisa ovata aut ovato-lanceolata, abrupte acuminata, 2-6 cm. lata; inferiora tripartita (aut interdum pinnata?—tantum unum inferius vidi), foliolis lanceolatis, acuminatis petiolis tenuibus 1-5 cm. longis. Capitula pauca, corymbosa solitaria in pedunculis subtenuibus, maiuscula, involucre ad anthesin circ. 6 mm. alto et (supra) 11 mm. lato, demum circ. 1.4 cm. alto et (supra) 1.2-3 cm. lato; pedunculis saepe bracteatis, 2-11 cm. longis. Involucri bractee exteriores 7 aut 8, foliosae, obtuse oblongo-lanceolatae, glabrae, apice obscure induratae, demum 1.5-1.8 cm. longae et 2-3 mm. latae, interioribus longiores. Ligulae non observatae. *Achaenia* linearia, nigra, exalata, glabra aut sparsim setoso-hispida, apice vero exaristata, plerumque sub apicem biaristata aristis brevibus et retrorsum (1-3 setis) hispidis, 8-13 mm. longa.

SPECIMENS EXAMINED.—*C. N. Forbes* 27 K, Haupu near Lihue, Kauai, July 9, 1909 (Herb. Bishop Mus., type; Herb. Field Mus., no. 485137).

Bidens cuneata, sp. nov. (pl. XIII).—Frutex ramosus, verisimiliter 6-10 dm. altus, ramis dichotomis, tenuibus, infra foliosis, supra in pedunculos productis. Folia crassiuscula, rhomboideo-ovata, dentata (dentibus in latere singulo plerumque 3-5), ad apicem acuta, ad basim anguste aut late cuneata, petiolis adjectis 3-5 cm. longis et 1-2 cm. latis, petiolis tenuibus, 1-2 cm. longis. Capitula solitaria, ligulata, ad anthesin circ. 6 mm. alta et 2-2.5 cm. lata, pedunculis tenuibus 0.8-1.8 dm. longis. Involucri bractee exteriores circ. 7, lineares, glabratae, glandulo-apiculatae, bractee interiores subaequantes. Ligulae late lanceolatae, flavae, ad

apicem dentulatae, 8–11 mm. longae. *Achaenia* linearia, exalata, ad margines sparsissime ciliata, ad apicem ciliato-coronata, exaristata, 6–7 mm. longa.

SPECIMENS EXAMINED.—*W. A. Bryan*, Diamond Head, Oahu, in 1903 (Herb. Bishop Mus., type).

Bidens setosa, sp. nov.—Gracilis, glabra, supra herbacea, infra forsan suffruticosa, caule tetragono, ramoso, \pm 8 dm. alto. Folia membranacea, plus minusve ciliata, saepe sparsissime adpresso-hispida, serrata dentibus mucronatis; summa nunc indivisa, ovata aut lanceolata, ad apicem acuta vel acuminata, petiolis adjectis 3–6 cm. longa, nunc tripartita; inferiora tripartita vel pinnata foliolis ovatis vel lanceolatis, petiolis adjectis 4–7 cm. longa et 2.5–3.5 cm. lata; petiolis tenuissimis, 1–3 cm. longis. Capitula corymboso-paniculata interdum numerosa, parva, ligulata, ad anthesin 5–6 mm. alta et 1.5–2 cm. lata, pedunculis tenerrimis 1–4 cm. longis. Involucri bractee exteriores 4–6, patentes aut reflexae, lineares, ciliatae et plus minusve pubescentes, 1.5–2.5 mm. longae, interioribus breviores. Ligulae plerumque 5, flavae, anguste oblongo-ellipticae, apice (saepe profunde et acriter) dentatae, 5.5–8 mm. longae. *Achaenia* lineari-fusiformia, interiora supra anguste elongata, omnia exalata, exaristata, plerumque valde setoso-hispida setis singulis aut saepe 2–5-aggregatis, apice setoso-coronata, 7–10 mm. longa.

SPECIMENS EXAMINED.—*C. N. Forbes* 811 K, Waimea Drainage Basin, west side, Kauai, July 3 to August 18, 1917 (Herb. Bishop Mus., two type sheets; Herb. Field Mus., no. 485165).

Bidens Forbesii, sp. nov. (pl. XIV).—Herbacea supra, infra verisimiliter fruticosa, caule ramisque tetragonis, glabra, probabiliter 7–10 dm. alta. Folia inferiora magna, tripartita, petiolis adjectis 1–2.5 dm. longa et 5–15 cm. lata, foliolis lanceolatis, longe acuminatis, membranaceis, creberrime serratis dentibus acribus et longe mucronulato-inflexis, 1–1.4 dm. longis et 3.5–5 cm. latis, petiolis tenuibus 6–8 cm. longis; foliis superis minoribus, 7–10 cm. longis et 4–5 cm. latis. Capitula parva, supra folia exserta, subcorymbosa, ad anthesin 4–5 mm. alta et circ. 1.5 cm. lata. Involucri bractee exteriores circ. 3–4, anguste lineares, ad apicem acutae, glanduloso-pulverulentae aut fere glabratae, patentes aut

reflexae, circ. 1.5 mm. longae, interioribus paulo longioribus. Ligulae circ. 5, flavidae, anguste oblongo-obovatae, apice valde acriterque 2-dentatae, 6–8 mm. longae. Unum achaenium maturum visum nigrum, valde arcuatum et tortum, glabrum, exalatum, exaristatum, circ. 1 cm. longum; achaeniis immaturissimis biaristatis, aristis retrorsum 1–2-hamosis.

SPECIMENS EXAMINED.—*C. N. Forbes* 82 K, Waioli Valley, Kauai, July 23, 1909 (Herb. Bishop Mus., two type sheets).

Bidens waianensis, sp. nov.—Frutex glaber, supra ramosus, verisimiliter 5–8 dm. altus. Folia gracilia, pinnata aut plus minusve bipinnata, petiolis adjectis 4–12 cm. longa et 3–6 cm. lata, foliolis primariis lanceolatis serratis acuminatis aut iterum pinnatis lobis ultimis linearibus integris ad apicem acriter mucronatis, petiolis tenuissime 2–4 cm. longis. Capitula multa, corymbosa aut corymboso-paniculata, ad anthesin circ. 6 mm. alta et 1.5–2 cm. lata, breviter supra folia exserta, floribus 15–25. Involucri bracteae exteriores circ. 6, lineares, glabratae aut sparsim glanduloso-pulverulentae, ad apicem subacutae, 1–2 mm. longae, quam bracteae interiores dimidio breviores. Ligulae circ. 5, flavidae, oblongo-oblancoolatae, ad apicem obtusae, circ. 1 cm. longae. Achaenia nigra, valde torta, glabra aut versus apicem remote setosa, exalata matura exaristata et 6–10 mm. longa.

SPECIMENS EXAMINED.—*C. N. Forbes* 2023 O, Kolekole Pass, Waianae Range, Oahu, February 1 and 2, 1915 (Herb. Field Mus., no. 485291, type; Herb. Bishop Mus., a form with leaflets much broader than in the type specimen); U.S. S. Pacif. Expl. Exped. (under *Captain Wilkes*), Kaala Mountains, Waianae Range, Oahu, 1838–1842 (Herb. Bishop Mus.; Herb. New York Bot. Gard., two sheets); *J. F. G. Stokes*, Kolekole Pass, Waianae Range, Oahu, in 1915 (Herb. Bishop Mus.).

ASA GRAY had determined the specimens collected under Captain WILKES as being *Bidens micrantha* Gaud. (*Coreopsis micrantha* Gray). Later, in discussing *Bidens micrantha* (Proc. Amer. Acad. 5:127. 1862), he said: "Sandwich Islands, especially Oahu. Variable in the foliage, which is commonly more dissected than in GAUDICHAUD's figure." Clearly GRAY had in mind the *Wilkes* plants, collected in the Waianae Range on Oahu. A study of the more recent specimens by FORBES and by STOKES, collected in the same immediate locality, shows the identical peculiarities of foliage. Furthermore, the floral and achenial characters are seen to be very distinct from those of the more widely distributed *Bidens micrantha*, which occurs not only on Oahu but also on Hawaii, Maui, and Lanai.

Bidens torta, sp. nov.—Fruticosa, glabra, caule non crasso ± 5 dm. alta. Folia tripartita, membranacea, serrata, ciliata, tenerime petiolata, petiolis adjectis 7–16 cm. longa et 2.5–10 cm. lata, foliolis acuminatis, terminali multo maiore, oblongo-lanceolato, lateralibus sessilibus aut breviter petiolulatis, ovato-lanceolatis, petiolis 1–4 cm. longis. Capitula numerosa, laxe paniculata, mediocria, ligulata, ad anthesin circ. 5 mm. alta et 1.7 mm. lata. Involucri bractee exteriores circ. 5, tenuiter lineares, glanduloso-pubescentes, 1.5–2.5 mm. longae, interioribus paulo breviores. Ligulae circ. 5, oblongo-ob lanceolatae, flavae, ad apicem plus minusve dentulatae, circ. 7 mm. longae. Achaenia tenuiter linearia, nigra, maxime torta, glabra, corpore 9–13 mm. longa ad apicem calva aut obscure 1–2-aristata aristis glabris brevissimis (0.1–0.3 mm. longis).

SPECIMENS EXAMINED.—*C. N. Forbes* 2092 O, Kawaihoa, Oahu, March 2–5, 1915 (Herb. Bishop Mus., type; Herb. Field Mus., no. 485294).

The leaves of this species appear to have rather large leaflets in proportion to the thickness of the petiole. The terminal leaflet becomes 1 dm. long and 4.4 cm. wide. The branches of the inflorescence are slender and widely diverging. The leaves and inflorescence combine to give a striking superficial resemblance to certain Central American specimens of *B. squarrosa* H. B. K. The achenes surpass those of nearly all other species in the amount of twisting. The twisting commences early, in the young achene, and the mature achenes are frequently twisted through four or five complete revolutions.

BIDENS GRACILIS Nutt., Trans. Amer. Phil. Soc. Ser. II. 7:368. 1841; *Campylotheca gracilis* Walp., Rept. Bot. Syst. 2:618. 1843.—No described species of *Bidens* has been left heretofore in greater obscurity than *B. gracilis*. From the time of NUTTALL's original description, no botanist appears to have given it serious attention. In 1843 WALPER categorically transferred the species, along with two others described by NUTTALL, to *Campylotheca*. In 1862 GRAY (Proc. Amer. Acad. 5:128) referred it, along with *Bidens mutica* Nutt., to *B. sandvicensis* Less. NUTTALL's types of *B. gracilis* and *B. mutica* are still extant in a state of excellent preservation (Herb. Brit. Mus.). The type of *B. gracilis* is clearly distinct from that of *B. mutica*. It is distinct also from the specimens that I assume to be of the type collection of *B. sandvicensis* Less. by CHAMISSE from Oahu (for example, *distrib. Acad. Petropol. in Hb. Kew, ex Hb. Hookeri*). In 1888 HILLEBRAND doubtfully referred

the species to a variety of *Bidens macrocarpa*, but NUTTALL's type is not even remotely matched by the type material (Herb. U.S. Nat. Mus.; Herb. N.Y. Bot. Gard.; Herb. Gray) of *B. macrocarpa*. It is, however, the same as *Mann* and *Brigham* 98, distributed to various herbaria as *B. hawaiiensis*. *B. hawaiiensis* is a much coarser plant and differs in many characters from *B. gracilis*. From all other species of the Hawaiian Islands *B. gracilis* is sharply distinct. From the several specimens studied, I have drawn up the following amplified description:

BIDENS GRACILIS Nutt., descript. amplificat. (pl. XIII).—Frutex gracilis, glabra, ramosa ramis rubescentibus, verisimiliter 6–9 dm. alta. Folia plerumque serrata aut etiam laciniato-dentata, acuminata; nunc indivisa et ovata aut lanceolata, petiolis adjectis 3–7.5 cm. longa et 1–2 cm. lata; nunc tripartita, foliolis lanceolatis, foliolo terminali 4–5 cm. longo et 1–1.5 cm. lato, lateralibus dimidio minora; petiolis tenuibus, 1–2 cm. longis. Capitula parva, paniculata paniculis trichotomis, ligulata, ad anthesin 6–7 mm. alta et circ. 1 cm. lata, pedunculis gracilibus 0.5–2.5 cm. longis. Involucri bracteae exteriores lineares, patulae, supra subglandulosae, interioribus adpressis fere dimidio breviores. Ligulae circ. 5, lanceolatae, flavae, ad apicem dentatae, 3–6 mm. longae. Achaenia torta, linearia, corpore \pm 8 mm. longa, facie et marginibus glabra aut sparsissime hispida, apice setuloso-ciliata, nunc brevissime biaristata aristis 0.3–0.8 mm. longis et glabris aut versus apicem retrorsum hispidulis, nunc uniaristata aut etiam exaristata, saepe omnibus tribus formis in eodem capitulo.

SPECIMENS EXAMINED.—*Thos. Nuttall*, Oahu (Herb. Brit. Mus., type); *Mann* and *Brigham* 98, Oahu (Herb. Bishop Mus.; Herb. Cornell Univ.; Herb. Field Mus.); *C. N. Forbes* 1184 O, Moanalua Valley, Oahu, March 9, 1909 (Herb. Bishop Mus.).

BIDENS MICRANTHA Gaud. Voy. Freycinet Bot. 464. *pl.* 85. 1826–1829.—*Campylothea micrantha* Cass. Dict. Sci. 51:475. 1827; *Coreopsis micrantha* Gray, Proc. Amer. Acad. 5:127. 1861; *Bidens Remyi* Drake del Cast. Illustr. Fl. Ins. Mar. Pacif. *pl.* 39. 1888; *Coreopsis Remyi* Drake del Cast., *loc. cit.*, 210.—The identity of *Bidens micrantha* Gaud. has long been a matter of conjecture with most authors. Many appear to have assumed that GAUDI-

CHAUD's original plate was only a crude representation, and that hence the delineation of foliage, etc., given there must not be interpreted very literally. Consequently, various other species have been referred arbitrarily to *B. micrantha* to such an extent that references in literature to *B. micrantha* Gaud. are almost entirely untrustworthy. In studying the recent collections from the Hawaiian Islands, I was impressed with the resemblance of a certain plant (*G. C. Munro* 602, see later) to GAUDICHAUD's illustration. The leaves possessed the same peculiar outlines as in the drawing. A careful study of the plant showed that it was positively the true *B. micrantha*. Several other plants that, while varying in various minor details from this plant, were seen to belong nevertheless with it specifically, were then assembled. From this small group of specimens I have been able to draw up the following amplified description.

BIDENS MICRANTHA Gaud., *descript. amplificat.*—Frutex glabra, caule plus minusve rubido, 6–9 dm. alta. Folia gracilia, crassiuscula, irregulariter 3–5-foliolata aut summa simplicia, petiolis adjectis 4–13 cm. longis, foliolis anguste lanceolatis, acuminatis, utroque latere paucis dentulis ad medium serrato, 2–5 cm. longis et 4–12 mm. latis, petiolis 1.5–5 cm. longis. Capitula numerosa, paniculata aut corymbosa, ligulata, ad anthesin 4–6 mm. alta et 1.5–2 cm. lata, pedicellis tenerrimis 1–2.5 cm. longis. Involucri bractee exteriores lineares, resino-pubescentes aut glabratae, minimae (circ. 1.5 mm. longae), bracteis interioribus multo minora. Ligulae 3–5, anguste oblongae, flavae, saepe ad apicem obscure dentatae, circ. 1 cm. longae. Achaenia linearia, nigra, compressa, recta vel torta, facie et marginibus plerumque glabra, 7–10 mm. longa, apice nunc exaristata et setosa, nunc breviter biaristata aut etiam (marginibus excurrentibus sub apicem) irregulariter quadriaristata, aristas glabras aut retrorsum hispidulis.

SPECIMENS EXAMINED.—*M. J. Remy* 281, Hawaii, 1851–1855 (Herb. Gray; Herb. Mus. Hist. Nat. Paris; type material of *Bidens Remyi* Drake del Cast. *non nobis*; *Coreopsis Remyi* Drake del Cast.); *C. N. Forbes* 14 H., Puuwaawaa, Hawaii, June 8–14, 1911 (Herb. Bishop Mus.); *idem* 326 Mo., ridge and foot of Lahainaluna Valley, Maui, February 1913 (Herb. Bishop Mus.); *G. C. Munro* 602, ridge to Puu Kukui, Maui, September 26, 1916 (Herb. Bishop Mus.; one of the achenes was 3-awned!); *idem* 122, Waiapaa, Lanai, September 26, 1913

(Herb. Bishop Mus.; form very close to GAUDICHAUD's original plate); *C. N. Forbes*, Kaala Mountains, Makaha Valley, Oahu, February 12-17, 1909 (Herb. Bishop Mus.; Herb. Field Mus., no. 485330; a form somewhat atypic as to foliage); *Hillebrand* and *Lydgate*, Kula, Maui (Herb. Bishop Mus.).

BIDENS MACROCARPA (Gray) Sherff.—*Coreopsis* (*Campylotheca*) *macrocarpa* Gray, Proc. Amer. Acad. 5:126. 1862.

BIDENS MACROCARPA, descript. amplificat.—Fruticosa, erecta, glabra (1-1.6 m. alta fide Hillebr. Fl. Haw. 214. 1888). Folia subcrassa, ternata aut pinnata aut summa saepe maximam partem simplicia, petiolo adjecto 0.5-2.2 dm. longa; foliolis (3-5) ovatis aut ovato-lanceolatis, cuspidatis, acriter et saepe creberrime serratis (dentibus interdum valde inflexis), lateralibus 2-6 cm. longis et 1-2 cm. latis, terminali maiore et saepius acuminato, petiolulis lateralium plerumque 2-15 mm. longis; petiolis tenuibus, 2-10 cm. longis. Inflorescentia laxa, aperta, foliolis linearibus vestita, folia superans; capitulis non numerosis, non minutis, ligulatis, ad anthesin 7-8 mm. altis et circ. 3 cm. latis. Involucri bractee subaequales, exteriores (5-7) crassae, late lineares, glabrae, circ. 6 mm. longae. Ligulae (5-7) flavae, trifida, 1-1.6 cm. longae; disci floribus 15-20. Achaenia pro capitulo magna, late linearia, striata, glaberrima aut marginibus et apice setulosa, erecta aut subtorta, 1.2-2 cm. longa, exalata aut anguste alata, alis in duo dentes aut aristas sub achaeni corporis apicem productis; aristis remotissime et minutissime, antrorsum et retrorsum barbatis, raro glabratiss.

SPECIMENS EXAMINED.—*Capt. Wilkes*, U.S. S. Pacif. Expl. Exped., 1838-1842, Oahu (Herb. U.S. Nat. Mus., type; Herb. N.Y. Bot. Gard.; Herb. Gray); *Hillebrand* and *Lydgate*, Konahuanui, Oahu, Hawaiian Islands, October 1872 (Herb. Bishop Mus.); *A. A. Heller* 2901, on and near the summit of Konahuanui, Oahu, November 2, 1895 (Herb. Mo. Bot. Gard.; Herb. N.Y. Bot. Gard.; Herb. U.S. Nat. Mus.); *C. N. Forbes* 2221 O, Wahiawa-Kahana trail, Oahu, August 17-20, 1915 (Herb. Bishop Mus.); *idem*, Palolo Valley ridges, Oahu, December 17, 1908 (Herb. Bishop Mus.); *idem* 2313 O, ridge and foot, Kalihi Valley, Oahu, March 9, 1916 (Herb. Bishop Mus.); *idem*, Lanihuli Trail, Oahu, October 14, 1908 (Herb. Bishop Mus.); *idem*, Koolauloa Mountains between Punaluu and Kaipapau, Oahu, May 3-8, 1909 (Herb. Bishop Mus.); *idem* 2553 O, Manoa Ridge, Oahu, March 17, 1919 (Herb. Bishop Mus.).

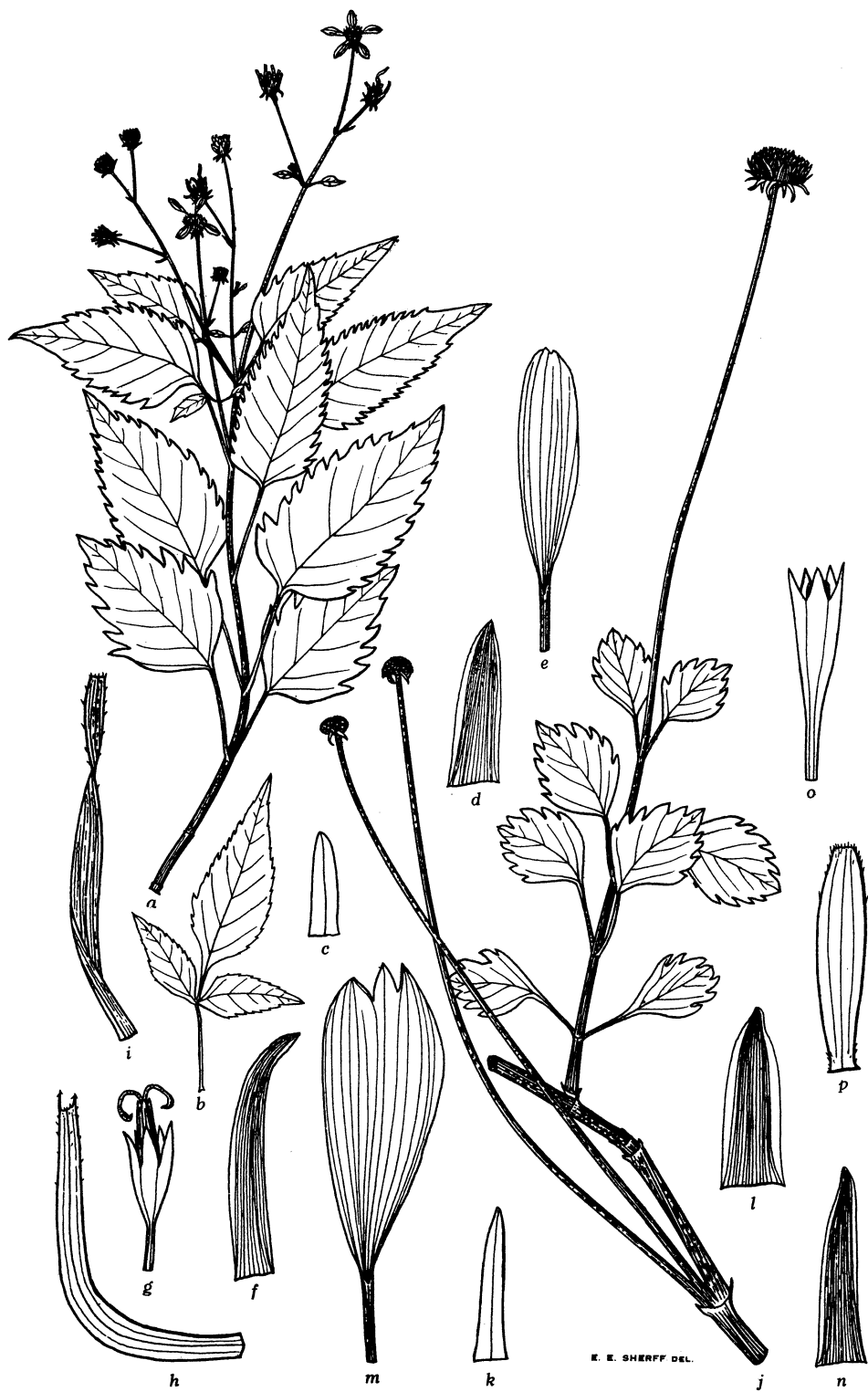
A distinguishing character of this species is the appearance of the large fruiting heads. The achenes become elongate, wide, thickish, and usually very glabrous. In no other species is the tendency to have awns placed below the achene's top (that is, upon the margins and more or less decurrent with the achene edge or wing) more pronounced than here.



SHERFF on BIDENS



E. E. SHERFF DEL.



SHERFF on BIDENS



SHERFF on BIDENS

Bidens linearifolia (O. and H.), comb. nov.—*Coreopsis linearifolia* Oliver and Hiern, Fl. Afr. Trop. 3:390. 1877; *Bidens Schweinfurthii* Sherff, Bot. Gaz. 59:309. 1915.—In 1915, on finding it necessary to transfer this species from *Coreopsis* to *Bidens*, I purposely created the new name *Bidens Schweinfurthii* “to avoid any possible confusion with *Bidens linearifolia* Schz. Bip.” (Bot. Gaz. 59:309). This appeared to me to be much the most desirable procedure. Nevertheless, in view of the fact that *Bidens linearifolia* Schz. Bip. is not a true *Bidens*, but is rather a species of *Cosmos* (*C. linearifolius* Hemsley, Biol. Centr. Amer. 2:200. 1881), the International Rules require the retention of OLIVER and HIERN’s trivial name.

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EXPLANATION OF PLATES XI-XIV

PLATE XI

Bidens exigua (a-f') and *B. duranginensis* (g-m'): a, an entire plant $\times 0.64$; a', fruiting head $\times 0.64$; b, b', exterior involucre bracts $\times 5$; c, interior involucre bract $\times 5$; d, palea $\times 5$; e, disk floret $\times 5$; f, f', outer and inner achenes $\times 5$; g, branch and portion of main stem $\times 0.64$; h, exterior involucre bract $\times 5$; i, interior involucre bract $\times 5$; j, ligulate floret $\times 5$; k, palea $\times 5$; l, disk floret $\times 5$; m, m', outer and inner achenes $\times 5$; a-f', from type of *B. exigua* in U.S. Nat. Herb.; g-m', from type of *B. duranginensis* in Herb. Gray.

PLATE XII

Bidens asplenoides (a-f) and *B. Stokesii* (g-o): a, branch $\times 0.61$; b, exterior involucre bract $\times 6$; c, interior involucre bract $\times 6$; d, ovary $\times 6$; e and f, fragments of mature achenes $\times 6$; g-i, branch and additional leaves $\times 0.61$; j, exterior involucre bract $\times 6$; k, interior involucre bract $\times 6$; l, ligulate floret $\times 6$; m, palea $\times 6$; n, disk floret $\times 6$; o, achene $\times 6$; a-f, from type of *B. asplenoides*, g-o, from type of *B. Stokesii*, both in Herb. Bishop Mus.

PLATE XIII

Bidens gracilis (a-i) and *B. cuneata* (j-p): a, branch $\times 0.71$; b, leaf $\times 0.71$; c, exterior involucre bract $\times 7$; d, interior involucre bract $\times 7$; e, ligulate floret $\times 7$; f, palea $\times 7$; g, disk floret $\times 7$; h and i, achenes $\times 7$; j, branch and two old peduncles, apparently of previous season's growth $\times 0.71$; k, exterior involucre bract $\times 5$; l, interior involucre bract $\times 5$; m, ligulate floret $\times 5$; n, palea $\times 5$; o, disk floret $\times 5$; p, achene $\times 5$; a, c-i, from Mann and Brigham 98, Herb. Bishop Mus.; b, illustrating trifoliate leaf, from Forbes 1184 O. Herb. Bishop Mus.; j-p, from type of *B. cuneata*, Herb. Bishop Mus.

PLATE XIV

Bidens Forbesii: a, upper portion of plant $\times 0.61$; b, leaf from sterile branch $\times 0.61$; c, exterior involucre bract $\times 6$; d, interior involucre bract $\times 6$; e, ligulate floret $\times 6$; f, palea $\times 6$; g, disk floret $\times 6$; h, very young achene $\times 6$; i, mature achene $\times 6$; a, c-i, from first type sheet, b, from second type sheet in Herb. Bishop Mus.